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ABSTRACT

The document contains two reports on consequences of population trends for families and older adults in the United States. The reports were submitted as testimony before congressional committees on population and aging. The first report discusses projected changes in American family life in light of population growth, enrollment in schools and colleges, and labor force participation. Findings from analysis of population data indicate that changes in family life will be consistently smaller after 1970 than they were from 1950 to 1970. Major reasons for this slower rate of change include slackening in the birth rate, enrollment in schools and colleges, and labor force participation. The conclusion is that Americans will cope with pressures that affect nuclear family life by means of adjustments such as delays in marriage, decline in family size, and increasing diversity of living arrangements. The second report discusses projections of population, health, and mortality trends among persons 65 years old and older from 1976 to 2020. Prospective trends indicate that the proportion of elderly persons in the total population will rise more slowly than in the past, life expectancy at birth will remain around 73.5 years, moderate reductions in death rates for men and women will occur in the next several decades, and the health needs of the elderly will account for a larger share of the national budget. (DB)

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Two Statements before
Congressional Committees

# THE FUTURE OF THE AMERICAN FAMILY

Paul C. Glick

# PROSPECTIVE TRENDS IN THE SIZE AND STRUCTURE OF THE ELDERLY POPULATION, IMPACT OF MORTALITY TRENDS, AND SOME IMPLICATIONS

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# PREFACE

This report presents two statements that were submitted as parts of testimony before Congressional Committees in May 1978 and are considered to be of special interest to many persons who use Census Bureau reports on population. "The Future of the American Family" was prepared by Paul C. Glick, Senior Demographer in the Population Division, for the Select Committee on Population, U.S. House of Representatives. The hearings were conducted on May 23, 1978, under the Chairmanship of Congressman James H. Scheuer and examined the "Domestic Consequences of U.S. Population Change."

"Prospective Trends in the Size and Structure of the Elderly Population, Impact of Mortality Trends, and Some Implications" was prepared by Jacob S. Siegel, Senior Statistician for Demographic Research and Analysis in the Population Division. It was prepared for presentation at a special hearing of the Select Committee on Aging, U.S. House of Representatives, under the Chairmanship of Congressman Claude Pepper, held jointly with the Select Committee on Population on May 24, 1978. This session continued to examine population changes in the United States, but with particular reference to the elderly population.

# THE FUTURE OF THE AMERICAN FAMILY

Paul C. Glick

**Slowdown in population change.** A reasonable expectation is that further changes in American family life will significantly lessen during the next two decades. This position is supported by related conclusions that were reached in a monograph, **The Population of the United States, Trends and Prospects: 1950 to 1990**, that was prepared by staff members of the Census Bureau's Population Division as background material for the World Population Conference in Bucharest, Romania, in 1974. In that monograph, even the *high* projected rates of change in population growth, enrollment, and the labor force during the 20 years between 1970 and 1990 are consistently smaller than the corresponding rates of change that had already taken place during the 20 years between 1950 and 1970.

The prospect of such a slowdown in social change could turn out to be seriously in error, particularly if some unforeseen change of great consequence should develop in the meantime. But several aspects of the present situation are at least consistent with an outlook of less change ahead.

In the first place, the decline in the birth rate during the last two decades has provided much momentum to a wide variety of other changes, as will be domonstrated in later sections. The relevant fact here is that this decline has gone about as far as it can go, and most demographers do not expect it to rise very significantly in the next decade or two.

In the second place, the great amount of increase in school and college enrollment during the last two decades has influenced other changes but is most unlikely to be repeated again in the next couple of decades. The proportion of young people who graduate from high school has been on a plateau of about 85 percent during the 1970's. The proportion of men in their late twenties who have completed a year or more of college after graduating from high school has reached 60 percent, and the comparable proportion of women has approached 50 percent; these levels are 10 or more percentage points higher than a decade ago and seem unlikely to rise by a similar amount during the next decade.

In the third place, the recent rate of increase in the proportion of women in the labor force has been dramatic, going up from 38 percent in 1960 to 48 percent in 1977. Without a continuing decline in the birth rate and with less increase in the educational level of the young adult population, along with other changes not mentioned, the odds seem to favor a slackening of the rate of increase in the labor force participation of women over the next decade or two. The worker rate for men has been declining for several years; this trend may diminish or be slightly reversed in future years by the lifting of the mandatory retirement age and by the easing of entry into the labor force by young men (and women) a decade or two from now because of the relatively small size of the cohorts that will be seeking to be absorbed into the labor market at that time.

These slackening changes in the birth rate, the enrollment rate, and the labor force participation rate seem likely to have a dampening impact on patterns of future change in family life.

**Changes in the family life cycle.** Longtime trends in demographic variables that are used to study the family life cycle have been primarily affected by downward trends in the birth and death rates. This conclusion was reached by Glick (1977) on the basis of an analysis of changes over the 80-year period from the early 1900's through the 1970's.

Aside from the baby boom after World War II, the birth rate has followed a generally downward direction until the present time. The average family that was formed in the early years of the 20th century included four children, whereas the average family formed in the 1930's included three children. Families formed during the familistic era of the 1950's had one additional child, but those forming at the present time expect to have only two children, on the average.

Today's young family of two children stands in sharp contrast with their great-grandparents' family of four children. Other things being equal (though they may not be), one would expect that the father and mother of today can spend more time with each of their children and with each other apart from their children. The period of childrearing has been shortened by about 3 years; and the period after the children leave home has been increased by 11 years (from 2 years to 13 years), largely as a consequence of the improvement in survival rates among adults.

Accordingly, young couples today can expect to live as a "childfree" twosome for about 14 more years than their elders, with most of the increase coming in middle age and later. These 14 years represent nearly one-third of the entire 44 years of married life for the shrinking proportion of couples with continuous first marriages. The degree of satisfaction those later years bring depends on many tangible and intangible factors concerning how well the two relate to each other and to their grown children. (All but a few—between 5

and 10 percent will have some children.) That satisfaction has a good chance of being affected by the rising status of women and the concomitant increase in singlehood and divorce. The extent to which young adults are postponing marriage and to which adults of all ages are dissolving their marriages in divorce will be treated in the next two sections of this statement.

**Will the postponement of marriage continue?** Persons in their twenties, when most of those who marry do so, are now postponing entry into their first marriage until they are about 1½ years older than their counterparts two decades ago. Thus, in 1977 the median age at first marriage was 24.0 years for men and 21.6 years for women. In 1956 the median ages at marriage were the youngest on record: 22.5 years for men and 20.1 years for women (U.S. Bureau of the Census, March 1977).

Additional evidence of much more postponement of marriage now than formerly is provided by the increase of one-half between 1960 and 1977 in the proportion of women 20 to 24 years of age who had never married (from 28 percent in 1960 to 45 percent in 1977). During this period the same rate of increase was recorded in the postponement of marriage among women in their late twenties (from 10.5 percent to 16.1 percent).

One of the tangible factors that probably helps to explain the increasing postponement of marriage is the 5-to-10-percent excess of women as compared with men during recent years in those ages when most first marriages occur (18 to 24 years for women and 20 to 26 years for men). This imbalance is a consequence of past fluctuations in the birth rate. For example, women born in 1947 after the baby boom had begun were ready to marry in 20 years, but the men they were most likely to marry were born in 1944 or 1945 (about one-half in each year) when the birth rate was still low; these men were about 8 percent less numerous than the 20-year-old women. (By contrast, girls who were born during the last 15 years while the birth rate has been declining will be scarce as compared with eligible men when they reach the main ages for marriage.)

The longer the pattern of increasing postponement of marriage persists, the more likely the prospect becomes that the extent of lifetime singlehood among young adults of today will increase (Carter and Glick, 1976, pp. 406-407). As recently as 1940, about 9 percent of the women in middle age had never married. That proportion had dropped to only 4 percent by 1977; this all-time low rate of lifetime singlehood was experienced by a cohort that was in or near the peak years for marriage during the 1950's when the age at marriage was low and the marriage and birth rates were high. Unless the cohort of women now in their twenties has an unusually large number of late marriages, the chances are that 6 percent—or even 7 or 8 percent—of them will go through life without ever becoming married. These projected rates may seem to be relatively small, but in reality they amount to half again up to twice as large a proportion as that experienced by those 20 years older.

**The marriage and divorce rates have stabilized; will they remain stable?** As the young people born during the baby boom became of age to marry, the marriage rate increased until it reached a peak of 11.0 per 1,000 population in 1972. From that level it declined to 10.0 in 1975 and has fluctuated very little since then. (Annual rates for the 12 months ending in a given month have fluctuated between 9.9 and 10.1; the rate for 1976 as a whole was 9.9, and for 1977 it was 10.1) On the other hand, the divorce rate continued its historic rise until it reached a peak of 5.1 per 1,000 population in 1977. Now for nearly 2 years (from April 1976 through January 1978) the divorce rate (for the 12 months ending in a given month) has been virtually unchanged. (It rose to 5.1 in only 3 of the 22 months; it was 5.1 for 1977 as a whole, but it was 5.0 in every month of 1977 except December, and it fell sharply to 4.4 in January 1978.)

The future propensity of young adults to marry cannot be forecast with a great degree of confidence. Nevertheless, there are reasons to expect the proportion of young adults who marry to level off or to rise moderately for a few years and then to rise still more after that time.

If the marriage propensity tends to stabilize or to rise moderately during the next few years, one of the reasons will probably be little further change in the postponement of first marriage, and another may be an increase in the number of late first marriages among those who have been postponing them. Still another reason may be a discontinuation of the pronounced decline in the remarriage rate that was observed between 1972 and 1975—the latest period for which data are available. These developments would likely be stimulated if the outlook for the improvement in business conditions and in the employment of young adults were to be generally favorable. These developments would likely be hampered, however, if the outlook continues to be clouded by high levels of inflation and by high rates of unemployment among the millions of young persons who were born during the baby boom.

If the focus is on the more remote period of one or two decades from now, the prospects for an increasing proportion of young adults to marry should be better because of the greater ease with which the labor market should be able to absorb the relatively small cohort of young adults at that time. Of course, changes in the sizes of age groups during successive stages of the life cycle and simultaneous changes in employment conditions are not the only critical variables affecting the level of the marriage rate, but they are surely two of the most important variables.

The future course of the divorce rate is also difficult to forecast. But to the extent that the level of divorce is related to the level of marriage, the prospect for divorce to decline somewhat in the next few years seems reasonable. This conclusion rests on the fact that divorce tends to occur a few years after marriage and that the peak in marriage was reached in 1972, whereas the current high level of divorce was reached about 2 years ago. The lag between marriage and divorce is as follows: half of the divorces after first marriage occur during the first 7 years after marriage, and half of the divorces after remarriage occur during the first 3 years. The

marriage rate has fallen now about one-tenth from its highest level, therefore, it should not be surprising if the divorce rate should also fall somewhat during the next year or two. Thereafter, fluctuations in the divorce rate might be expected to occur in a pattern similar to future fluctuations in the marriage rates of about 4 to 6 years earlier, if the divorce level has essentially stabilized.

A rise in the divorce rate during the last decade has occurred among couples of all ages, but by far the greatest age-specific rate of increase has taken place among couples in the range of 25 to 39 years of age—the range within which three-fifths of all divorces occur. Between 1968 and 1975, the divorce rate per 1,000 married persons went up 70 percent for those 25 to 39, as compared with 50 percent for those under 25 and those 40 to 64 years old; it went up 35 percent among those 65 and over. These findings appear to contradict the impression among many counselors of persons with marital stress problems, namely, that the greatest increase has been among persons in middle age. Those counselors' impressions may actually be correct in the sense that there may have been a disproportionately large rate of increase among the clients in middle age who seek the services of marriage and divorce counselors; persons in this age range are most likely to be sufficiently affluent to afford such services and are also most likely to have complex property settlements to consider.

Despite a threefold increase since 1960 in the number of children of divorced parents who live with a divorced father, the proportion of children living with a divorced father has not changed very much; it has remained at the level of about one-tenth of all children who live with a divorced parent. The reason for this finding is that there has also been a threefold increase since 1960 in the number of children who live with a divorced mother.

**What is the outlook for change among one-parent families?** Despite substantial increases in divorce and informal living arrangements during the last couple of decades, the preponderant majority of people still live in households maintained by a nuclear family. Specifically, 7 of every 8 of the 213 million persons in the noninstitutional population of the United States in 1977 were residents of nuclear family households:

77 percent were in husband-wife households; and
10 percent were in one-parent households; thus,
87 percent were in nuclear family households.
7 percent were living alone as one-person households;
1 percent were in households of unmarried couples; and
5 percent were in various other living arrangements.
100 percent. (In 1970, 1 percent of all persons were in institutions.)

That is the big picture. One feature of it that may be particularly surprising is the smallness of the proportion of *persons* living in the households of one-parent families. An obvious reason is that such families include only one parent instead of two. Another is that only 54 percent of all families have any "own" children under 18 years of age in the household. In fact, 18 percent of the 64 million noninstitutional *children* of this age in 1977 were living in one-parent families.

79 percent of all children under 18 lived with two parents;
18 (17.7) percent lived with one parent; and
3 percent lived with neither parent, but usually with relatives.
100 percent. (In 1970, 0.4 percent of all children were in institutions.)

But some of the 79 percent of children under 18 in 1977 living with two parents were living with a stepparent or were born to their current parents after one or both had remarried.

66 percent lived with both natural parents in their first marriage;
5 percent lived with both natural parents but one or both had remarried; thus,
71 percent lived with both of their natural parents.
8 percent lived with a stepparent (i.e., were born before the natural parent they live with had remarried).
79 percent (see above). (This includes some adopted children, not separately identified.)

The 18 percent of children who lived in one-parent families in 1977 were very unevenly distributed among parents by marital status and race. They also represent a doubling of the corresponding proportion in 1960 (up from 9 to 18 percent). (In absolute numbers, the increase amounted to a rise from 7.1 million in 1960 to 11.3 million in 1977.)

| Sex and marital status of parent | Percent of children under 18 living with one parent | | |
|---|---|---|---|
| | All races | White | Black |
| 1977, total..... | 17.7 | 13.3 | 43.2 |
| Living with: | | | |
| Mother only..... | 16.3 | 11.9 | 41.7 |
| Father only..... | 1.4 | 1.4 | 1.4 |
| Marital status of parent: | | | |
| Divorced..... | 7.2 | 6.7 | 9.9 |
| Married..... | 5.9 | 4.0 | 17.5 |
| Separated..... | 5.0 | 3.2 | 15.9 |
| Widowed..... | 2.4 | 1.9 | 5.0 |
| Single..... | 2.2 | 0.6 | 10.7 |
| 1970, total..... | 13.4 | 10.3 | 31.5 |
| 1960, total..... | 9.1 | 7.1 | 21.7 |

Information from the same sources as the accompanying exhibit shows that the number of children under 18 years old rose from 64.3 million in 1960 to 69.5 million in 1970 and then, because of the declining birth rate, it fell to 64.1 million in 1977. Thus, the total number of young children in 1977 was about the same as in 1960, but in the meantime, the number living with a separated parent doubled, the number living with a divorced parent tripled, and the number

living with a never-married parent became seven times as high. By contrast, the number of children living with two parents actually declined by 10 percent (from 56.3 million in 1960 to 50.8 million in 1977), and the number living with a widowed parent declined 20 percent (from 1.5 million to 1.2 million).

On balance, there are still close to 4 of every 5 young children living with two parents and most of the rest living with one parent. Even so, this situation is significantly different from that in 1960 when 7 of every 8 lived with two parent—more often their own natural parents then than now.

Most people would probably agree that living with two relatively harmonious parents is a desirable situation for children. The Census Bureau cannot demonstrate whether most of the decline since 1970 in the number of children living with two parents has occurred among those whose parents were not very harmonious, but it can demonstrate that about five-sixths of that decline has occurred among children whose parents were not high school graduates. (Data presented here are for children whose parents were under 45 years old.) Meantime, three-fourths of the increase among children living with their mother only has occurred among those whose mothers were high school graduates or who had completed some college training. In fact, the number of children in one-parent families whose mother was a college graduate doubled between 1970 and 1977 (from 148,000 to 351,000), whereas the number of children in two-parent families whose father was a college graduate increased by only 1 percent (from 7.5 million to 7.6 million). (Data for 1977 are not available on the educational level of the mother in two-parent families.)

Despite the substantial increase among children in one-parent families where the parent has graduated from high school (and is therefore most likely to be self-maintaining), the fact remains that nearly one-half of the children in one-parent families live with a parent who has never completed high school. This proportion is about twice as large as that for two-parent families. Thus, the pattern of change with respect to one-parent families is mixed and may be expected to continue to be that way. Young mothers who are economically independent and who choose to live at least for a while in the unmarried state may be expected to go on increasing in numbers (Ross and Sawhill, 1975). At the same time, the number of poorly educated mothers who are reported as living apart from the father of their children may be expected to continue to account for a small proportion of the increase in one-parent families; that proportion was one-fourth between 1970 and 1977.

But there is some reason to believe that many of these poorly educated and impoverished mothers with no husband reported as living in the home may actually have had a husband present who was not so reported because of such reasons as the consequences on their eligibility for welfare benefits. A closely related finding is as follows: the proportion of Black families reported as maintained by a woman in 1977 (37 percent) was much larger than that for White families (11 percent). Making use of estimates of undercounting in the 1970 census and relevant assumptions, the author reached the conclusion that probably one-fourth to one-third of the difference between the proportion of Black families and White families reported as maintained by a woman could be explained by the much larger undercount of Black men than that for White men (Glick and Mills, in press).

**Where do the noncustodial parents and other unmarried persons live?** To a large extent, the counterpart of one-parent families consists of *young* separated and divorced persons who live apart from their spouse (or ex-spouse) and their children, if any. These persons have contributed heavily to the rapid increase during the 1970's in the number of young adults who were living alone. The number of 1-person households maintained by adults under 35 years of age increased by 45 percent between 1970 and 1977, well above the rate of increase for any other age group. About one-fourth of these young adults living alone in 1977 were separated or divorced, and a substantial majority were men. Most of the remainder were never-married persons living alone, many of whom would have been married if it had not been for the recent increase in the postponement of marriage.

Besides the one-fourth of young noncustodial parents who live alone, a somewhat larger proportion live in a family setting, usually with their parents. This living arrangement is much more typical of separated than divorced persons. Most of the remainder live in with nonrelatives or share their living quarters with nonrelatives.

Unmarried couples of opposite sexes account for a numerically small but rapidly increasing type of living arrangement. Nearly 2 million adults in 1977 were sharing their living quarters with only one other unmarried adult, consisting of a man with a woman living in (606,000 men and 606,000 women) or consisting of a woman with a man living in (351,000 women and 351,000 men). These 1.9 million adults constituted an 83-percent increase over their 1,046,000 counterparts in 1970 (Glick and Norton, 1977).

Most of these adults are relatively young (three-fourths being under 45 years of age), but one-tenth include a man or a woman 65 years old or older. An estimated 3.6 percent of all unmarried adults and 8.3 percent of the divorced men under 35 in 1977 were involved in an unmarried couple lifestyle. Of all the one-parent families, about 3 or 4 percent included an unmarried couple. Unmarried couples were more likely to consist of a man and a woman neither of whom had graduated from high school or both of whom had an incomplete college education than would be expected if they were randomly distributed among all couples.

Although only 2 percent of the "couple households" in the 1977 cross-section survey consisted of unmarried couples, some unknown additional proportion of young adults will adopt this lifestyle for at least a period of several months or have previously done so. In the early 1970's, the proportion in Sweden comparable with the 2 percent for the United States was 12 percent (Trost, 1975) and has risen since that time. Whether the *lifetime* proportion of unmarried couples among young adults in this country will rise from its present level of 2 percent to a 12- or 15-percent level is

difficult to conjecture. Although the current trend is in that direction, it is probably too early to expect it to rise that high.

**The family (in modified form) will go on.** This paper has documented some of the substantial changes that have been occurring in regard to marriage, family size, and living arrangements and has offered some opinions about likely future changes in these aspects of family life. In spite of the demonstrable delay in marriage, the decline in family size, the upturn in divorce, and the increasing diversity of living arrangements, the overwhelming majority of American people still live in nuclear families that include a married couple and/or a parent and one or more children (Glick, 1978). This assertion is not meant to minimize the extent of recent changes but to imply that the American people have been showing a great degree of resilience in coping with pressures that affect their family life and are likely to continue to do so (Bane, 1976).

The judgment presented here is that most of the changes in family life over the next two decades will be small as compared with those during the last two decades. Of course, the future changes in some respects, such as the living arrangements of unmarried young adults, may continue to change considerably in view of the recency of the sharp increase in the experimentation in this area.

Underlying many of the Nation's family problems during the 1960's and 1970's has been the difficulty of coping with the tremendous task of absorbing into the social system the massive number of young adults who were born during the period of high birth rates after World War II. High unemployment rates and inflated prices for consumer products and services must have also contributed to the increasing delay in marriage, the reduction in births, the evident difficulty of keeping marriages intact, and associated changes in the composition of households.

The delay in marriage should have the favorable side effect of expanding the range of social relations before marriage, thereby increasing the chances that a rational choice of a marriage partner will be made at a more mature age than formerly. Through a cumulative process, delayed marriage also generally means still further delayed childbearing. Research demonstrates that delaying childbearing is one factor associated with a smaller number of children and fewer unwanted births (Westoff, 1978).

Obtaining no more than the desired number of children is now within the realm of possibility for most young adults through modern effective means of contraception. One of these means that has been adopted by a rapidly growing proportion of contraceptors is sterilization of the husband or the wife. This increasing use of sterilization deserves more attention than it has received as a means for promoting slow population growth in future years. As long as sterilization cannot be reversed, it will prevent those who adopt it from changing their minds about having additional children and contributing thereby to a new baby boom. At the same time, lack of access to, or use of, effective contraception by sexually active adolescents continues to be a serious problem (Baldwin, 1976).

The advantages of having a large family in an agrarian economy no longer apply to the current American scene. In earlier times the mother of many children usually found her time fully occupied with household duties, but now half of the mothers (usually with only one, two, or possibly three young children) are using their high school or college education to gain employment outside the home. Once these mothers have overcome the obstacles to such employment, few of them are likely to forego the advantages, particularly those women with no children below school age. Two of the most needed supports for working parents are good quality day care for children below school age and the opportunity to work part time or on a flexible time schedule so that one parent can be at home while the children are not in school. One obvious way to provide more good quality day care for children would be to increase the use of persons trained to teach who find no jobs and to place them with the children in vacated school buildings, with costs shared by parents and the local government on the basis of the parent's ability to pay for this service. Such a program would become more feasible if it were supported by the necessary Federal funding.

Delaying marriage has been associated with an increase in the work experience of women who have never married. This experience makes women more employable as they enter marriage, and increasingly makes it possible for them to work on a continuous basis with a few months off for childbearing. The more employable they become and the fewer children they have as a partial consequence thereof, the more economically independent young mothers become and the more likely they are to seek a divorce if their marriage comes under serious stress.

Thus, the new options that have emerged during the last generation or two for women to become well-educated, to obtain employment outside the home, to limit the size of their family, and to end an unsatisfactory marriage in divorce, have created a setting in which an increase in divorce should not be very surprising. The new options have therefore come at a price (Bronfenbrenner, 1976). But the price is not too high insofar as it has made divorce a real alternative to a marriage that becomes a threat to the mental health and general well-being of persons who are directly involved (Norton and Glick, 1976).

During the last two decades social pressure has been diminishing for young adults to marry, to have children, and to stay married. During the next decade or two social pressure may also be expected to diminish for both a working mother and her husband to be employed on a full-time basis. Relaxation of pressures in these ways would be expected to increase the quality of the marriages that are initiated and of those that remain intact.

An appropriate closing to these thoughts about the future of the American family is the following sentence from President Carter's announcement of the forthcoming White House Conference on Families: "I am confident that the American family is basically sound and that we can and will adjust to the challenges of changing times."

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# PROSPECTIVE TRENDS IN THE SIZE AND STRUCTURE OF THE ELDERLY POPULATION, IMPACT OF MORTALITY TRENDS, AND SOME IMPLICATIONS

Jacob S. Siegel*

For convenience and simplicity, in the present discussion the age range 65 and over as a whole is employed as the principal basis for identifying and describing the elderly population. Although as a group the elderly population is markedly different in its demographic and socioeconomic characteristics from the population at the younger ages, it is not a homogenous group, and various age segments within it should be considered separately in any detailed analysis of the characteristics of the group. If we compare the population 85 and over with the population 65 to 74, for example, we find many sharp differences with respect to such characteristics as living arrangements, marital status, work status, income, education, health, kinship support, and use of leisure time.[1]

## SIZE AND STRUCTURE OF THE ELDERLY POPULATION

### Numbers and Proportions

**Change in numbers.** Between now and the end of the century the population 65 and over is expected to grow at only about half the rate of the past quarter century, but this growth will still be considerable:

| Period | Percent increase | | | |
|---|---|---|---|---|
| | 65 and over | 65 to 74 | 75 to 84 | 85 and over |
| 1950 to 1976.... | 85 | 67 | 104 | 233 |
| 1976 to 2000.... | 39 | 23 | 57 | 91 |
| 2000 to 2020.... | 42 | 61 | 15 | 27 |

During this period, this age group will increase by nearly 40 percent, from 23 million in 1976 to 32 million in 2000 (table 1). The age group is expected approximately to double between 1976 and 2020, when we should have about 45 million elderly persons. In this period, all age segments of the elderly population are expected to grow rapidly, particularly the extreme aged. In fact, the percent changes show a regular progression with age for the 1976-2000 period. The population 65 to 74 should increase by about 23 percent, the population 75 to 84 by about 57 percent, and the population 85 and over by about 91 percent.

We can have a fair degree of confidence in the projections of the general level of the population and the growth rates shown, since the accuracy of projections of population *numbers* for the older age groups is dependent essentially on the accuracy of the projections of mortality, particularly for the older ages. Reasonable alternative projections of mortality would not seriously alter the population projections (see below).

The general rise in the numbers of births, particularly up to the early 1920's, is the principal factor that accounts for the large past and prospective increases in the number of elderly persons. Past and prospective declines in death rates, and immigration, particularly the heavy volume of immigrants prior to World War I, serve also to augment the number of elderly persons but they play a distinctly secondary role. The sharp drop in the rate of increase in the 65-and-over population after about 1990, lasting about two decades, is a result of the rapid drop in the number of births during the 1920-30 and 1930-40 decades. The baby boom cohorts cause the leap forward in the elderly population after 2010.

**Change in the proportion of elderly persons.** The proportion of elderly persons in the total population is likely to continue to rise, but more slowly than in the past. The rise may not be a steady one because of the probable fluctuations in future fertility, but two of the three series of projections published by the Census Bureau (those having lower fertility) show a general rise in the proportion and all of the projected range for the proportion is above the level of 1976. Changes in the proportion of the elderly are directly affected by projections of the total population, and hence of fertility, as well as by projections of the elderly population. Hence, we can have much less confidence in these figures.

If fertility moves toward replacement level (fertility somewhat above the level of 1976) between 1976 and 1990,

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[1] For a more comprehensive treatment of this subject, see U.S. Bureau of the Census, "Demographic Aspects of Aging and the Older Population in the United States," by Jacob S. Siegel, **Current Population Reports**, Series P-23, No. 59 (rev.), May 1976.

## Table 1. Total Population in the Older Ages and Decennial Increases: 1950 to 2040

(Numbers in thousands. Estimates and projections as of July 1. Figures refer to the total population of the 50 States and District of Columbia. A minus sign (-) denotes a decrease. See text for explanation of Series I, II, and III)

| Year | 60 years and over | | | 65 years and over | | | 70 years and over | | | 75 years and over | | | 85 years and over | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Increase in preceding decade | | | Increase in preceding decade | | | Increase in preceding decade | | | Increase in preceding decade | | | Increase in preceding decade | |
| | Number | Amount | Percent | Number | Amount | Percent | Number | Amount | Percent | Number | Amount | Percent | Number | Amount | Percent |
| ESTIMATES | | | | | | | | | | | | | | | |
| 1950 | 18,500 | (X) | (X) | 12,397 | (X) | (X) | 7,348 | (X) | (X) | 3,904 | (X) | (X) | 590 | (X) | (X) |
| 1960 | 23,828 | 5,328 | 28.8 | 16,675 | 4,278 | 34.5 | 10,394 | 3,046 | 41.5 | 5,621 | 1,717 | 44.0 | 940 | 350 | 59.3 |
| 1970 | 28,753 | 4,925 | 20.7 | 20,087 | 3,412 | 20.5 | 13,065 | 2,671 | 25.7 | 7,600 | 1,979 | 35.2 | 1,432 | 492 | 52.3 |
| 1976 | 32,244 | (X) | (X) | 22,934 | (X) | (X) | 14,654 | (X) | (X) | 8,741 | (X) | (X) | 1,966 | (X) | (X |
| PROJECTIONS[1] | | | | | | | | | | | | | | | |
| 1980 | 34,724 | 5,971 | 20.8 | 24,927 | 4,840 | 24.1 | 16,227 | 3,162 | 24.2 | 9,434 | 1,834 | 24.1 | 2,294 | 862 | 60.2 |
| 1990 | 40,184 | 5,460 | 15.7 | 29,824 | 4,897 | 19.6 | 19,803 | 3,576 | 22.0 | 12,021 | 2,587 | 27.4 | 2,881 | 587 | 25.6 |
| 2000 | 41,973 | 1,789 | 4.5 | 31,822 | 1,998 | 6.7 | 22,630 | 2,827 | 14.3 | 14,386 | 2,365 | 19.7 | 3,756 | 875 | 30.4 |
| 2010 | 49,850 | 7,877 | 18.8 | 34,837 | 3,015 | 9.5 | 23,211 | 581 | 2.6 | 15,060 | 674 | 4.7 | 4,575 | 819 | 21.8 |
| 2020 | 63,265 | 13,415 | 26.9 | 45,102 | 10,265 | 29.5 | 29,126 | 5,915 | 25.5 | 16,975 | 1,915 | 12.7 | 4,776 | 201 | 4.4 |
| 2030 | 70,737 | 7,472 | 11.8 | 55,024 | 9,922 | 22.0 | 37,936 | 8,810 | 30.2 | 23,170 | 6,195 | 36.5 | 5,681 | 905 | 18.9 |
| 2040 (II) | 69,806 | -931 | -1.3 | | | | | | | | | | | | |
| Range (III) | 68,566 | -2,171 | -3.1 | 54,925 | -99 | -0.2 | 40,774 | 2,838 | 7.5 | 27,907 | 4,737 | 20.4 | 7,980 | 2,299 | 40.5 |
| Range (I) | 71,445 | 708 | 1.0 | | | | | | | | | | | | |

(X) Not applicable.
[1]Base date of projections is July 1, 1976.

Source: U.S. Bureau of the Census, Current Population Reports, Series P-25, Nos. 311, 519, 614, 643, and 704.

as in the Series II Census Bureau projections,[2] we can expect about 12 percent of the population to be aged 65 and over in the year 2000 and about 15½ percent in 2020, as compared with 10.7 percent in 1976 (table 2 and figure 1). The proportions 65 and over in 2020 corresponding to the population projections based on below-replacement fertility (Series III Census Bureau projections) and above-replacement fertility (Series I Census Bureau projections) are 18 and 13 percent, respectively. As fertility decreases, with a given level of mortality, the proportion of the older population tends to increase. The Bureau of the Census series of projected percents 65 and over at 10-year intervals to 2040, including the projected range, is as follows:

| Year | Percent |
|---|---|
| 1976 | 10.7 |
| 1980 | 11.2 (11.1 - 11.3) |
| 1990 | 12.2 (11.7 - 12.6) |
| 2000 | 12.2 (11.3 - 12.9) |
| 2010 | 12.7 (11.1 - 13.9) |
| 2020 | 15.5 (12.7 - 17.8) |
| 2030 | 18.3 (14.0 - 22.1) |
| 2040 | 17.8 (12.5 - 22.8) |

If fertility continues at current levels and mortality declines moderately, as is assumed, the percentage of elderly persons can be expected to fall just below the highest percentage (18 percent) shown for the year 2020. A sharp rise will occur in the 2010-25 period (unless fertility rises well above replacement level) because of the entry of the 1945-60 baby-boom cohorts into the 65-and-over population. There may be only a modest rise or a decline in the proportion after 2025, as a result mainly of the decline in the number of births after 1960.

Fertility has been and will continue to be a more important determinant of shifts in the proportion of the older population than mortality. Both recent changes in the birth rate and shifts in the numbers of births 65 years earlier jointly affect the proportion of elderly. Changes in death rates affect the proportion also but their influence is quite limited.[3] Furthermore, as appears to have occurred in the earlier part of this century, declines in death rates may tend to retard or contribute only slightly to the rise in the proportion of elderly persons.[4] When, as for the Census Bureau projections, the greater declines in death rates are assumed to occur at the older ages, the effect is to raise the proportion. At low levels of fertility, only extremely large future reductions in mortality occurring mainly at the older ages could contribute to substantial increases in the future percentage of the elderly. If fertility turns up and mortality declines only moderately, as is possible, the proportion of elderly persons in the population may stop rising and may even decline (e.g., Series I Census Bureau projections, 1990 to 2010).

[2]The basic fertility assumptions employed in developing the three series of population projection relate to the average numbers of children born to a woman in her lifetime:

| | |
|---|---|
| Series I | 2.7 children per woman |
| Series II | 2.1 children per woman |
| Series III | 1.7 children per woman |

Only one mortality assumption (moderate declines) and one immigration assumption (400,000 net immigration per year) are combined with these three fertility assumptions in the Census Bureau population projections.

[3]Ansley J. Coale, "The Effects of Changes in Mortality and Fertility on Age Composition," **Milbank Memorial Fund Quarterly**, Vol. 34, No. 1, January 1956, pp. 79-114.

[4]Albert I. Hermalin, "The Effect of Changes in Mortality Rates on Population Growth and Age Distribution in the United States," **Milbank Memorial Fund Quarterly**, Vol. 44, No. 4, Part 1, October 1966 pp. 451-469.

## Table 2. Percent of the Total Population in the Older Ages, by Sex: 1950 to 2020

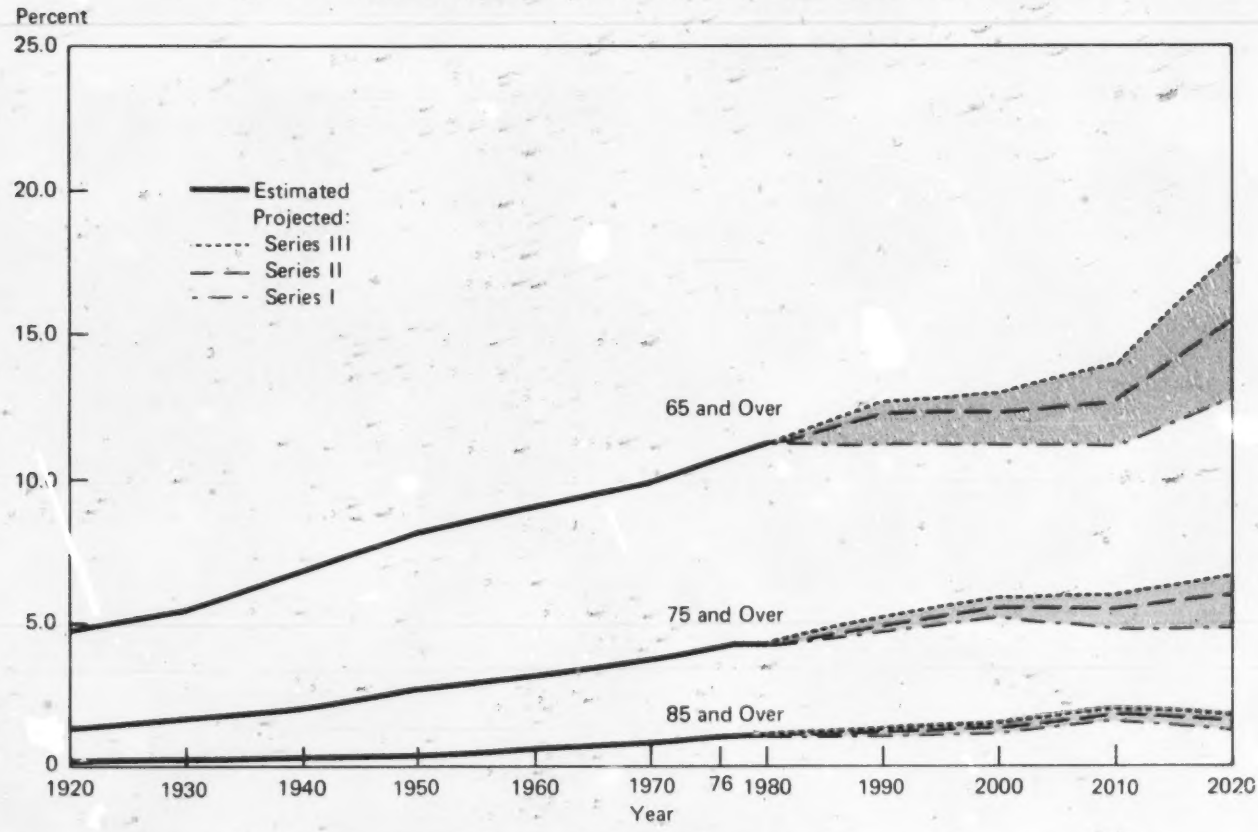
(Estimates and projections as of July 1. Based on totals including Armed Forces overseas. See text for explanation of Series I, II, and III)

| Age and sex | | | | | Projections[1] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1980 | | 2000 | | 2020 | |
| | | | | | | Range | | Range | | Range |
| | 1950 | 1960 | 1970 | 1976 | II | I to III | II | I to III | II | I to III |
| ALL RACES | | | | | | | | | | |
| Both sexes | | | | | | | | | | |
| 60 years and over | 12.1 | 13.2 | 14.1 | 15.0 | 15.6 | 15.5 to 15.7 | 16.1 | 14.8 to 17.1 | 21.8 | 17.9 to 25.0 |
| 65 years and over | 8.1 | 9.3 | 9.9 | 10.7 | 11.2 | 11.1 to 11.3 | 12.2 | 11.3 to 12.9 | 15.5 | 12.7 to 17.8 |
| 70 years and over | 4.8 | 5.8 | 6.4 | 6.8 | 7.3 | 7.2 to 7.4 | 8.7 | 8.0 to 9.2 | 10.0 | 8.2 to 10.2 |
| 75 years and over | 2.6 | 3.1 | 3.7 | 4.1 | 4.2 | 4.2 to 4.3 | 5.5 | 5.1 to 5.9 | 5.9 | 4.8 to 6.7 |
| 85 years and over | 0.4 | 0.5 | 0.7 | 0.9 | 1.0 | 1.0 to 1.0 | 1.4 | 1.3 to 1.5 | 1.6 | 1.3 to 1.7 |
| Male | | | | | | | | | | |
| 60 years and over | 11.8 | 12.4 | 12.6 | 13.1 | 13.6 | 13.5 to 13.7 | 13.8 | 12.7 to 14.7 | 19.3 | 15.7 to 22.3 |
| 65 years and over | 7.7 | 8.5 | 8.5 | 9.0 | 9.3 | 9.3 to 9.4 | 10.0 | 9.2 to 10.7 | 13.2 | 10.7 to 15.2 |
| 70 years and over | 4.5 | 5.2 | 5.3 | 5.5 | 5.8 | 5.7 to 5.8 | 6.8 | 6.2 to 7.2 | 8.0 | 6.5 to 9.2 |
| 75 years and over | 2.3 | 2.7 | 3.0 | 3.1 | 3.1 | 3.1 to 3.2 | 4.0 | 3.7 to 4.2 | 4.3 | 3.4 to 4.9 |
| 85 years and over | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.6 to 0.7 | 0.8 | 0.8 to 0.9 | 0.9 | 0.8 to 1.1 |
| Female | | | | | | | | | | |
| 60 years and over | 12.5 | 14.1 | 15.6 | 16.8 | 17.6 | 17.4 to 17.7 | 18.3 | 16.9 to 19.3 | 24.1 | 20.0 to 27.5 |
| 65 years and over | 8.6 | 10.0 | 11.2 | 12.3 | 13.0 | 12.9 to 13.1 | 14.3 | 13.2 to 15.1 | 17.8 | 14.7 to 20.3 |
| 70 years and over | 5.2 | 6.3 | 7.5 | 8.1 | 8.8 | 8.7 to 8.8 | 10.5 | 9.7 to 11.1 | 12.0 | 9.9 to 13.6 |
| 75 years and over | 2.8 | 3.5 | 4.4 | 5.0 | 5.3 | 5.3 to 5.3 | 7.0 | 6.5 to 7.4 | 7.4 | 6.1 to 8.4 |
| 85 years and over | 0.5 | 0.6 | 0.9 | 1.2 | 1.4 | 1.4 to 1.4 | 2.0 | 1.9 to 2.1 | 2.3 | 1.9 to 2.6 |

[1] Base date of projections is July 1, 1976.

Source: U.S. Bureau of the Census, Current Population Reports, Series P-25, Nos. 311, 519, 614, 643, and 704.

## Figure 1. Percent of the Total Population in the Older Ages: 1920 to 2020




Note: Points are plotted for years ending in zero except for 1976.
Source: Table 2 and **Current Population Reports**, Series P-25, No. 311, 519, 614, 643, and 704.

## Age and Sex Composition

**Age pattern of the older population.** The older population has been getting older and is expected to continue doing so for a few decades. For example, the proportion of persons in the age group 65 and over who are 75 and over is now rising and will generally continue to rise until at least the year 2000. In 1976, the proportion in the older age group was 38 percent. In the year 2000, we can expect the proportion to be about 45 percent (table 3). It is then likely to fall back to about 38 percent again in 2020 as the larger cohorts born in the high fertility period following World War II enter the younger segment of the group (65 to 74 years).

**Change in sex balance.** Rates of increase are expected to be generally greater for elderly females than elderly males in the next few decades, but the tremendous differences in the growth rates of the sexes seen in the last few decades will not be repeated:

| Sex and period | Percent increase | | | |
|---|---|---|---|---|
| | 65 and over | 65 to 74 | 75 to 84 | 85 and over |
| Male | | | | |
| 1950 to 1976.. | 60 | 51 | 69 | 159 |
| 1976 to 2000.. | 36 | 24 | 55 | 69 |
| 2000 to 2020.. | 45 | 63 | 17 | 25 |
| Female | | | | |
| 1950 to 1976.. | 108 | 82 | 135 | 286 |
| 1976 to 2000.. | 41 | 22 | 58 | 101 |
| 2000 to 2020.. | 39 | 60 | 14 | 28 |

For each sex for the 1976-2000 period growth rates progress upward with increasing age.

There were 69 males for every 100 females in the age group 65 and over in 1976 (table 3). The deficit of males increases sharply with advancing age. At birth, the sex ratio has consistently been about 105-106. By ages 70-74 the sex ratio has fallen below 75 and by ages 85 and over it has fallen below 50.

The sex ratio at ages 65 and over is expected to fall to 67 per 100 by the year 2000 and then to rise, reaching 69 again by the year 2020. The sex ratio at ages 75 and over and 85 and over will also tend to continue declining for the next few decades.

The large excess of females over males among the elderly is also reflected in differences in the age distribution of the sexes. In 1976, 12.3 percent of the female population was over 65, as compared with 9.0 percent of the male population (table 2). In the year 2000, the percent for females may be as high as 15, compared with 11 percent for males, under the low fertility series. For older segments of the elderly population, the difference in the percents for males and females is even more pronounced.

**Role of fertility and mortality.** The main reason for the drop in the sex ratio *with increasing age* for past and current years is that male mortality has been higher than female mortality at each age of life for many decades in the United States.[5] This pattern is expected to continue. The main factor determining the declining trend in the sex ratios at each age *over time* is the relative level of male and female mortality, or more precisely, the relative levels of male and female survival rates. The death rates for the sexes at the various age groups have been steadily diverging, to the greater and greater disadvantage of males. The further decline or slight rise in the sex ratio of the population at the older ages projected for future years is a result of the assumption made in the Census Bureau projections that there will be a further slight divergence of male and female mortality rates.

## MORTALITY AND SURVIVAL

### Past General Trends

We can describe the 1940-54 period as one of generally rapid mortality declines in terms of age, sex, race, and cause-of-death categories. From 1954 until 1968, however, there was little progress in this regard. The expectation of life at birth and at age 65 remained nearly the same over the 14-year period from 1954 to 1968 (table 5). Since about 1968 the mortality of the older population has begun to fall again and the average rate of decline in death rates has been

[5] U.S. Bureau of the Census, **Current Population Reports**, Series P-23, No. 59 (rev.), **op. cit.**, esp. p. 13-14.

**Table 3. Percent Distribution of the Population 65 Years Old and Over, by Age: 1950 to 2020**

| Age | 1950 | 1960 | 1970 | 1976 | Projections 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| 65 years and over | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 65 to 69 years | 40.7 | 37.7 | 35.0 | 36.1 | 34.9 | 33.6 | 28.9 | 33.4 | 35.4 |
| 70 to 74 years | 27.8 | 28.6 | 27.2 | 25.8 | 27.3 | 26.1 | 25.9 | 23.4 | 26.9 |
| 75 to 79 years | 17.4 | 18.5 | 19.2 | 17.7 | 17.3 | 18.4 | 20.1 | 17.0 | 16.8 |
| 80 to 84 years | 9.3 | 9.6 | 11.5 | 11.9 | 11.3 | 12.2 | 13.3 | 13.1 | 10.2 |
| 85 years and over | 4.8 | 5.6 | 7.1 | 8.6 | 9.2 | 9.7 | 11.8 | 13.1 | 10.6 |

Source: U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 311, 519, 614, 643, and 704.

## Table 4. Sex Ratios of the Population, by Broad Age Groups: 1950 to 2020

(Males per 100 females. Estimates and projections as of July 1. Figures include Armed Forces overseas)

| Age and projection series | 1950 | 1960 | 1970 | 1976 | Projections 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| All ages.....II.. | 99.3 | 97.0 | 94.8 | 94.8 | 95.0 | 94.8 | 94.6 | 94.4 | 93.8 |
| Range..... I.. | | | | | 95.1 | 95.2 | 95.4 | 95.7 | 95.7 |
| III.. | | | | | 94.9 | 94.5 | 94.0 | 93.5 | 92.4 |
| Under 15 years..... | 103.8 | 103.4 | 103.9 | 104.2 | 104.5 | 105.1 | 105.2 | 105.1 | 105.1 |
| 15 to 29 years..... | 98.7 | 97.7 | 97.8 | 100.3 | 101.3 | 101.3 | 102.1 | 102.1 | 102.1 |
| 30 to 44 years..... | 97.4 | 95.5 | 95.2 | 95.8 | 96.6 | 97.2 | 96.7 | 96.8 | 97.3 |
| 45 to 59 years..... | 99.8 | 96.9 | 93.4 | 94.8 | 95.3 | 95.1 | 95.9 | 95.4 | 95.3 |
| 60 to 64 years..... | 100.4 | 91.2 | 87.7 | 87.9 | 87.9 | 98.8 | 89.9 | 91.1 | 90.9 |
| 65 to 69 years..... | 94.0 | 87.8 | 80.7 | 79.3 | 79.7 | 80.5 | 82.4 | 82.4 | 83.2 |
| 70 to 74 years..... | 91.3 | 85.3 | 73.9 | 73.5 | 72.4 | 72.9 | 74.6 | 74.8 | 75.9 |
| 75 to 84 years..... | 85.0 | 77.4 | 65.9 | 61.0 | 60.3 | 59.6 | 59.9 | 60.7 | 61.4 |
| 85 years and over..... | 70.0 | 63.8 | 53.2 | 47.0 | 44.7 | 40.9 | 39.4 | 38.8 | 38.5 |
| 65 years and over..... | 89.5 | 82.6 | 72.0 | 69.0 | 68.2 | 67.3 | 66.6 | 67.0 | 69.3 |
| 75 years and over..... | 82.6 | 75.0 | 63.3 | 57.7 | 56.2 | 54.7 | 54.0 | 53.4 | 54.2 |

Source: U.S. Bureau of the Census, Current Population Reports, Series P-25, Nos. 311, 519, 614, 643, and 704.

greater than during the 1940-54 period. In the 9-year period from 1968 to 1977, there was an average annual decline of 1.7 percent in the death rate at ages 65 and over, as compared with a decline of 1.5 percent for this age group in the 1940-54 period (table 6). The observed declines understate the real declines because of the aging of the elderly population itself.[6] As a result of the declines in death rates, life expectancies at birth and at age 65 have been climbing steadily upward; life expectancy at birth is estimated at 73.5 years in 1977 as compared with 70.2 years in 1968.

### Sex Differences

**Past trends.** As stated previously, the difference between the sexes in mortality levels is quite large and has been growing until recently. By 1976 the difference in the life expectancy at birth of males (69.0 years) and females (76.7 years) reached 7.7 years (table 5). It was only 4.3 years in 1940. An increasing part of the difference is accounted for by the difference in life expectancy at age 65. According to the death rates of 1976, the male-female difference in the average number of years lived in the age interval 0-64 years was 2.3 years, as compared with 4.3 years for age 65 and over.[7] By 1976 the death rate of males 65 and over exceeded the corresponding rate for females by nearly 50 percent (table 7).

**Basis of the gap.** Because of the magnitude, durability, and pervasive consequences for our society of the gap between male and female death rates, the basis for the gap is a matter of serious social concern. The gap is evidence of a considerable inequality between the sexes in the effects of environmental and/or genetic influences on mortality rates.

The evidence for the basis of the large and growing difference is conflicting, as suggested by a number of facts and studies. Social factors appear to exercise an important influence on the difference, but in combination with and in interaction with genetic and biological factors. Studies and analyses by Enterline,[8] Godley and Kruegel,[9] Retherford,[10] and Waldron[11] favor explanations primarily in terms of "environmental" factors. Others, such as the Madigan study,[12] favor explanations primarily in terms of (genetic and nongenetic) hereditary factors.

The study of Madigan, relating to mortality differences between brothers and nuns in Catholic teaching orders, concludes that the excess male mortality can be attributed to biological factors since the men and women can be assumed to have essentially the same life styles. Male fetal and infant mortality is markedly greater than female fetal and infant mortality. There is evidence that the female reproductive period is highly protective for women and, accordingly, the lengthening of the female reproductive period in the past centry, presumably due to improved nutrition and hygiene, has apparently afforded an increasing biological advantage to women.

[6] Mary Grace Kovar and Lois Fingerhut, "Recent Trends in U.S. Mortality Among the Aged," unpublished paper presented at the annual meeting of the Gerontological Society, San Francisco, California, November 21, 1977.

[7] The maximum number of years of life that may be lived in the interval under age 65 is, of course, 65 years. The "actual" figures for 1976 are 59.6 for males and 61.9 for females. The average number of years lived above age 65 is equal to life expectancy at age 65. Life expectancy at age 65 for 1976 is 13.7 years for males and 18.0 years for females.

[8] Philip E. Enterline, "Cause of Death Responsible for Recent Increases in Sex Mortality Differentials in the United States," **Milbank Memorial Fund Quarterly**, Vol. 39, No. 2, 1961, pp. 312-328.

[9] Frank Godley and David Q. Kruegel, "Cigarette Smoking and Differential Mortality: New Estimates from Representative National Samples," unpublished paper presented at the annual meeting of the Population Association of America, Seattle, Washington, April 17-19, 1975.

[10] Robert D. Retherford, "Tobacco Smoking and the Sex Mortality Differential," **Demography**, Vol. 9, No. 2, 1972, pp. 203-216, and **The Changing Sex Differential in Mortality**, Greenwood Press, Westport, Conn. 1975.

[11] Ingrid Waldron, "Why Do Women Live Longer Than Men?", **Journal of Human Stress**, Vol. 2, March 1976, pp. 2-13, and Ingrid Waldron and Susan Johnston, "Why Do Women Live Longer Than Men?", **Journal of Human Stress**, Vol. 2, June 1976, pp. 19-29.

[12] Francis C. Madigan, "Are Sex Mortality Differentials Biologically Caused?", **Milbank Memorial Fund Quarterly**, Vol. 35, No. 2, 1957, pp. 203-223.

## Table 5. Life Expectancy at Birth and at Age 65, by Race and Sex: 1900 to 1976

| Race and year | At birth | | | | At age 65 | | | |
|---|---|---|---|---|---|---|---|---|
| | Both sexes | Male | Female | Difference | Both sexes | Male | Female | Difference |
| ALL RACES | | | | | | | | |
| 1900-02 | 49.2 | 47.9 | 50.7 | 2.8 | 11.9 | 11.5 | 12.2 | 0.7 |
| 1939-41 | 63.6 | 61.6 | 65.9 | 4.3 | 12.8 | 12.1 | 13.6 | 1.5 |
| 1954 | 69.6 | 66.7 | 72.7 | 5.0 | 14.4 | 13.1 | 15.7 | 2.2 |
| 1968 | 70.2 | 66.6 | 74.0 | 7.4 | 14.6 | 12.8 | 16.3 | 3.5 |
| 1976 | 72.8 | 69.0 | 76.7 | 7.7 | 16.0 | 13.7 | 18.0 | 4.3 |
| WHITE | | | | | | | | |
| 1900-02 | 49.7 | 48.2 | 51.1 | 2.9 | 11.9 | 11.5 | 12.2 | 0.7 |
| 1939-41 | 64.9 | 62.8 | 67.3 | 4.5 | 12.8 | 12.1 | 13.6 | 1.5 |
| 1954 | 70.5 | 67.4 | 73.6 | 6.2 | 14.4 | 13.1 | 15.7 | 2.6 |
| 1968 | 71.1 | 67.5 | 74.9 | 7.4 | 14.7 | 12.8 | 16.4 | 3.6 |
| 1976 | 73.5 | 69.7 | 77.3 | 7.6 | 16.1 | 13.7 | 18.1 | 4.4 |
| BLACK AND OTHER RACES | | | | | | | | |
| 1900-02 | 33.8 | 32.5 | 35.0 | 2.5 | 10.9 | 10.4 | 11.4 | 1.0 |
| 1939-41 | 53.9 | 52.3 | 55.6 | 3.3 | 13.0 | 12.2 | 13.9 | 1.7 |
| 1954 | 63.4 | 61.0 | 65.8 | 4.8 | 14.6 | 13.5 | 15.7 | 2.2 |
| 1968 | 63.7 | 60.1 | 67.5 | 7.4 | 13.7 | 12.1 | 15.1 | 3.0 |
| 1976 | 68.3 | 64.1 | 72.6 | 8.5 | 15.8 | 13.8 | 17.6 | 3.8 |
| WHITE-BLACK DIFFERENCE | | | | | | | | |
| 1900-02 | 15.9 | 15.7 | 16.1 | (X) | 1.0 | 1.1 | 0.8 | (X) |
| 1939-41 | 11.0 | 10.5 | 11.7 | (X) | -0.2 | -0.1 | -0.3 | (X) |
| 1954 | 7.1 | 6.4 | 7.8 | (X) | -0.2 | -0.4 | - | (X) |
| 1968 | 7.4 | 7.4 | 7.4 | (X) | 1.0 | 0.7 | 1.3 | (X) |
| 1976 | 5.2 | 5.6 | 4.7 | (X) | 0.3 | -0.1 | 0.5 | (X) |

(X) Not applicable.

Source: National Center for Health Statistics (U.S. Public Service) and the U.S. Bureau of the Census. For 1976, "Advance Report-Final Mortality Statistics, 1976," Monthly Vital Statistics Report, Vol. 26, No. 12, Supplement (2), March 1978.

## Table 6. Death Rates for the Population 55 Years Old and Over, by Age: 1940 to 1977

| Year and period | 55 to 64 years | 65 to 74 years | 75 to 84 years | 85 years and over | 65 years and over |
|---|---|---|---|---|---|
| RATES PER 1,000 POPULATION | | | | | |
| 1940 | 22.2 | 48.4 | 112.0 | 235.7 | 72.2 |
| 1954 | 17.4 | 37.9 | 86.0 | 181.6 | 58.6 |
| 1968[1] | 17.0 | 37.2 | 82.9 | 195.8 | 61.4 |
| 1976 (prov.) | 14.8 | 31.4 | 73.2 | 156.1 | 54.2 |
| 1976 | 14.8 | 31.3 | 73.3 | 155.7 | 54.3 |
| 1977 (prov.) | 14.3 | 30.5 | 71.5 | 145.9 | 52.6 |
| PERCENT CHANGE | | | | | |
| 1940 to 1954 | -21.6 | -21.7 | -23.2 | -23.0 | -18.8 |
| 1954 to 1968 | -2.3 | -1.8 | -3.6 | +7.8 | +4.8 |
| 1968 to 1977 | -15.9 | -18.0 | -13.8 | -25.5 | -14.3 |

[1]Official estimates for 1968 have been revised by the Census Bureau on the basis of revised population estimates.

Source: National Center for Health Statistics (U.S. Public Health Service), various annual volumes of Vital Statistics of the United States and various issues of Monthly Vital Statistics Report.

**Table 7. Ratios of Male to Female Death Rates for the Population 55 Years Old and Over, by Age: 1900 to 1976**

| Year | 55 to 64 years | 65 to 74 years | 75 to 84 years | 85 years and over | 65 years and over |
|---|---|---|---|---|---|
| ALL CLASSES | | | | | |
| 1900 | 1.14 | 1.11 | 1.08 | 1.05 | 1.06 |
| 1940 | 1.45 | 1.29 | 1.17 | 1.08 | 1.17 |
| 1954 | 1.82 | 1.57 | 1.29 | 1.06 | 1.30 |
| 1968 | 2.07 | 1.88 | 1.46 | 1.18 | 1.44 |
| 1976 | 1.99 | 1.97 | 1.58 | 1.26 | 1.46 |

Source: U.S. Bureau of the Census, United States Life Tables, 1930, 1936; National Center for Health Statistics (U.S. Public Health Service), annual volumes of Vital Statistics of the United States, for 1940 and 1954, and "Advance Report - Final Mortality Statistics," Monthly Vital Statistics Report, Vol. 26, No. 12, Supplement (2), March 1978.

The changes in recent decades in the male-female mortality gap appear to be more associated with social and environmental factors. The Retherford study concluded that two-thirds of the divergence between the male and female death rates of adults in most of this century was due to smoking. Yet, females have taken up smoking in large and increasing numbers during this period, especially since World War II. Furthermore, during the same period larger and larger proportions of women have been joining the labor force. Presumably we should have seen some convergence of the death rates of men and women. The divergence observed has been occurring, therefore, in spite of the fact that the differences in the life styles and roles of men and women have diminished. It is notable that we find the largest difference in life expectancy at birth, some 10 years, in the USSR, where men and women occupy much more equal occupational roles than in the United States.[13] A major change in the relative mortality levels of the sexes is not expected to occur in the United States, if at all, until a whole generation of women is reared in the work ethic of males—that is, socialized from childhood with a "work-or-perish" life design.

The increasing male-female mortality difference may also be interpreted as a result of a major shift of the cause-pattern of mortality in this century, involving a sharp reduction in the relative importance of the infectious and parasitic diseases and maternal mortality and a rise in the relative importance of the chronic "degenerative" diseases, e.g., diseases of the heart, malignant neoplasms, cerebrovascular diseases. For the second group of causes, male rates tend to be much higher than female rates whereas, for many categories in the first group of causes, female rates tend to be more similar to those of male rates. Even for the second group, male-female differences have widened over the last several decades, however.

## Race Differences

There is still a difference of several years in life expectancy at birth between the races (White, Black-and-other-races). The difference has been reduced sharply over the last several decades, from about 11 years in 1940 to 5 years in 1976 (table 5). The difference in life expectancy at age 65 is small, however, and has been small throughout this whole period. The magnitude of the male-female differences in life expectancy and the evolution of the differences are similar for Whites and Blacks.

Death rates for the Black-and-other-races population are higher than for Whites below age 65 and at ages 65-74. There is then a crossover of the rates at ages 75-79 in the U.S. death registration data. The crossover is not to be viewed merely as a statistical artifact since the crossover phenomenon appears in many other paired comparisons, often involving data of high quality.[14] For example, it appears in death rates based on U.S. Social Security Administration ("Medicare") data, albeit at a higher age (ages 80-84). The Social Security data also reflect smaller differences between the races than the registration statistics.

Little attention has been given to the relative contribution of genetic and environmental influences to the White-Black mortality gap. The Kitagawa and Hauser study suggests that most of the difference may be accounted for by the difference in the socioeconomic status of the racial groups.[15]

[13] Jacques Vallin and Jean-Claude Chenais, "Evolution Récente de la Mortalité en Europe dans les Pays Anglo-Saxons et en Union Soviétique, 1960-1970," **Population**, Vol. 29, Nos. 4-5, July-Oct. 1974, pp. 862-898, esp. p. 863; Institut National d'Etudes Démographiques, "Sixième Rapport sur la Situation Démographique de la France," **Population**, Vol. 32, No. 2, March-April 1977, pp. 253-338, esp. 293-294.

[14] Charles B. Nam and Kathleen A. Ockay, "Factors Contributing to the Mortality Crossover Pattern: Effects of Developmental Level, Overall Mortality Level, and Causes of Death," unpublished paper submitted to the XVIII General Conference of the International Union for the Scientific Study of Population, Mexico City, August 8-13, 1977.

[15] Evelyn M. Kitagawa and Philip M. Hauser, **Differential Mortality in the United States: A Study in Socioeconomic Epidemiology**, Harvard University Press, Cambridge, Mass., 1973.

## Causes of Death

The cause-pattern for deaths of the elderly has continued to shift toward the chronic "degenerative" causes and away from the infectious-parasitic causes. The major chronic causes are moving in opposite directions, however, death rates from cancer have been rising sharply and death rates from the cardiovascular diseases have been falling sharply in the last decade.

Only a few categories of causes account for most deaths over age 65. In 1976 diseases of the heart accounted for 44 percent of all deaths at these ages, and diseases of the heart, malignant neoplasms, and cerebrovascular diseases accounted for three-quarters of the deaths (table 8). The rates for the remaining "leading" causes are so low that each cause, taken separately, accounts for less than 5 percent of the total number of deaths over age 65.

Additional insight into the current cause-pattern of mortality is secured by examining the possible gain in life expectancy from eliminating various causes of death and the chance of eventually dying from various causes. If all deaths from cardiovascular diseases were eliminated and if the chance of dying from the various causes is assumed to be independent, the gain in life expectancy at birth would be 12 years and the gain at ages 65 would be 11 years according to the 1969-71 death rates (table 9). Diseases of the heart account for about half of these additions to life expectancy. Roughly speaking, a 65-year old has a two-thirds chance of eventually dying from a cardiovascular disease—a 50 percent chance of dying from a disease of the heart and a one-seventh chance of dying from a cerebrovascular disease.

If all deaths from cancer were eliminated, 2½ years of life would be added at birth and 1½ years of life would be added at age 65. The elimination of cancer would have a much smaller effect on life expectancy at age 65 than the elimination of cardiovascular diseases because the cancer rate is much lower generally and because cancer is less concentrated at the older ages. A 65-year old has a one-sixth chance of eventually dying from cancer.

If all cancer mortality were eliminated, the total number of deaths would not be greatly reduced after a while since the persons saved would be subject to the residual death rate for all other causes, albeit at older ages.[16] Death rates at each age would fall but the chance of eventually dying from the other causes would rise. On the other hand, the saving of lives would be greater both initially and for a longer period if the cardiovascular diseases were eliminated, because the residual death rate would be reduced much more sharply.

[16] Nathan Keyfitz, "What Difference Would it Make if Cancer Were Eradicated? An Examination of the Taeuber Paradox," **Demography**, Vol. 14, No. 4, Nov. 1977, pp. 411-418, esp. p. 417.
U.S. Bureau of the Census, "Demographic Aspects of Aging and the Older Population in the United States," **op. cit.**, esp. p. 43.

### Table 8. Death Rates for the 10 Leading Causes of Death for Ages 65 and Over, by Age: 1976

(Deaths per 100,000 population)

| Cause of death by rank | 65 years and over | 65 to 74 years | 75 to 84 years | 85 years and over |
|---|---|---|---|---|
| All causes | 5,428.9 | 3,127.6 | 7,331.6 | 15,486.9 |
| 1 Diseases of the heart | 2,393.5 | 1,286.9 | 3,263.7 | 7,384.3 |
| 2 Malignant neoplasms | 979.0 | 786.3 | 1,248.6 | 1,441.5 |
| 3 Cerebrovascular diseases | 694.6 | 280.1 | 1,014.0 | 2,586.8 |
| 4 Influenza and pneumonia | 211.1 | 70.1 | 289.3 | 959.2 |
| 5 Arteriosclerosis | 122.2 | 25.8 | 152.5 | 714.3 |
| 6 Diabetes mellitus | 108.1 | 70.0 | 155.8 | 219.2 |
| 7 Accidents | 104.5 | 62.2 | 134.5 | 306.7 |
| Motor vehicle | 25.2 | 21.7 | 32.3 | 26.0 |
| All other | 79.3 | 40.4 | 102.2 | 280.7 |
| 8 Bronchitis, emphysema and asthma | 76.8 | 60.7 | 101.4 | 108.5 |
| 9 Cirrhosis of liver | 36.5 | 42.6 | 29.3 | 18.0 |
| 10 Nephritis and nephrosis | 25.0 | 15.2 | 34.1 | 64.6 |
| All other causes | 677.5 | 427.8 | 908.6 | 1,683.8 |

Source: National Center for Health Statistics (U.S. Public Health Service), "Advance Report-Final Mortality Statistics, 1976," Monthly Vital Statistics Report, Vol. 26, No. 12, Supplement (2), March 1978; and unpublished data provided by the National Center of Health Statistics.

**Table 9. Gain in Life Expectancy from Eliminating Specified Causes of Death and Chance of Eventually Dying from These Causes: 1969 to 1971**

| Cause of death | Gain in life expectancy (in years) | | Chance of eventually dying | |
|---|---|---|---|---|
| | At birth | At age 65 | At birth | At age 65 |
| Major cardiovascular-renal diseases | 11.8 | 11.4 | .588 | .672 |
| Diseases of the heart | 5.9 | 5.1 | .412 | .460 |
| Cerebrovascular diseases | 1.2 | 1.2 | .122 | .149 |
| Malignant neoplasms | 2.5 | 1.4 | .163 | .145 |
| Motor vehicle accidents | 0.7 | 0.1 | .020 | .006 |
| All other accidents | 0.6 | 0.1 | .026 | .018 |
| Influenza and pneumonia | 0.5 | 0.2 | .034 | .037 |
| Diabetes mellitus | 0.2 | 0.2 | .020 | .021 |
| Infective and parasitic diseases | 0.2 | 0.1 | .007 | .005 |

[1]Including neoplasms of lymphatic and hematopoietic tissues.

Source: National Center for Health Statistics, (U.S. Public Health service), "U.S. Life Tables by Cause of Death: 1969-71," by T.N.E. Greville, U.S. Decennial Life Tables for 1969-71, Vol. 1, No. 5, 1976.

It should be recognized that these figures have no *direct* implications for the future since complete elimination of the cardiovascular diseases or of cancer has not been projected or predicted. They mainly elucidate the current cause-pattern of mortality and hence may aid in planning current health programs.

## Projections of Mortality and Population

**Prospects for mortality reduction.** A number of different approaches may be taken in projecting death rates for the United States. One is to extrapolate past trends in age-sex-race-cause specific death rates. Another is to consider the rates in more analytic terms, for example, in terms of the factors affecting specific causes of death (e.g., dietary habits, smoking practices). An even more analytical step is to take account of competing risks and joint causes of death. Guides for extrapolation may be derived from the experience of countries with the lowest death rates at each age and from available studies of the biological "limit" of mortality.

Historical and comparative international demographic analysis suggests only moderate reductions in death rates in the United States in the next several decades. There is little basis for anticipating major increases in life expectation in this period,[17] and it is visionary to anticipate any extension of human life span.[18] Life expectation at birth for Sweden ("best" single country) in 1974 and life expectation for a composite "country" derived from the lowest death rates at each age for various countries around 1974 are only 3 to 5 years greater than for the United States in 1974 (table 10). At present mortality levels, even major (percentage) declines in death rates would correspond to only moderate (percentage) increases in life expectancy.[19] For example, if present death rates at each age were reduced by half, life expectation at birth would rise by only about 15 percent, that is, from 73 years to about 84 years. In the light of the present age structure of mortality, if large (absolute) reductions are to occur in mortality at all they would have to be concentrated at the older ages since death rates at the younger ages are already quite low.

Demographic analysis also suggests no great convergence of male and female mortality or life expectancy in the United States in the near future.[20] When the U.S. values for 1974 are compared with the figures for Sweden in 1974 and the country composite for "1974", the U.S. figures are found to be much closer to the attained best levels for

[17] Jean Bourgeois-Pichat, "Future Outlook for Mortality Decline in the World," unpublished paper presented at the meeting of the United Nations, Ad Hoc Group of Experts on Demographic Projections, New York, November 1977.

Nathan Keyfitz, "Cause of Death in Future Mortality," **Proceedings of the International Population Conference,** Vol. 1, pp. 483-503, International Union for the Scientific Study of the Population, Mexico City, Aug. 8-13, 1977.

[18] For a summary comment, see Bernice L. Neugarten, "The Future and the Young-Old," in Lissy F. Jarvik (ed.), **Aging into the 21st Century: Middle-Agers Today,** Gardner Press, Inc., New York, 1978.

[19] Nathan Keyfitz and Antonio Golini, "Mortality Comparisons: The Male-Female Ratio," **Genus,** Vol. 31, No. 1-4, 1975, pp. 1-34; Keyfitz, "What Difference Would it Make if Cancer were Eradicated? An Examination of the Taeuber Paradox," **op. cit.**; Jacob S. Siegel and Edwin Fonner, Jr., "Effect of Changes in Age-Specific Death Rates on Life Expectancy," unpublished paper presented at the annual meeting of the American Public Health Association, Miami Beach, Florida, Oct. 17-19, 1976.

[20] Bourgeois-Pichat, **op. cit.**; George C. Myers, "Changing Mortality Patterns and Sex Imbalances among the Aged," unpublished paper presented at the 10th International Congress of Gerontology, Jerusalem, Israel, June 1975.

**Table 10. Recent and Projected Values for Life Expectancy at Birth and at Age 65 for the United States and Comparative International Values**

| Year | At birth | | | | At age 65 | | | |
|---|---|---|---|---|---|---|---|---|
| | Both sexes | Male | Female | Difference[1] | Both sexes | Male | Female | Difference[1] |
| 1973[a] | 71.3 | 67.6 | 75.3 | 7.7 | 15.3 | 13.1 | 17.2 | 4.1 |
| 1974[b] | 71.9 | 68.2 | 75.9 | 7.7 | 15.6 | 13.4 | 17.5 | 4.1 |
| 1975[c] | 72.5 | 68.7 | 76.5 | 7.8 | 16.0 | 13.7 | 18.0 | 4.3 |
| 1976[d] | 72.8 | 69.0 | 76.7 | 7.7 | 16.0 | 13.7 | 18.0 | 4.3 |
| PROJECTIONS[e] | | | | | | | | |
| 1976 (Base) | 73.1 | 69.1 | 77.0 | 7.9 | 16.0 | 13.8 | 18.4 | 4.6 |
| 2000 | 74.1 | 70.0 | 78.3 | 8.3 | 16.8 | 14.2 | 19.0 | 4.8 |
| 2020 | 75.0 | 70.7 | 79.4 | 8.7 | 17.2 | 14.5 | 19.8 | 5.3 |
| 2050 | 76.4 | 71.8 | 81.0 | 9.2 | 18.0 | 15.0 | 20.7 | 5.7 |
| Best country composite, 1974 | 76.6 | 73.8 | 79.4 | 5.6 | 17.4 | 15.5 | 18.8 | 3.3 |
| Sweden, 1974 | 75.1 | 72.2 | 78.0 | 5.8 | 16.0 | 14.2 | 17.5 | 3.4 |
| Difference, United States and best country composite, 1974 | -4.7 | -5.6 | -3.5 | 2.1 | -1.8 | -2.1 | -1.3 | 0.8 |

[1]Excess of female over male value.

Sources:

a. National Center for Health Statistics, "Final Mortality Statistics, 1973," Monthly Vital Statistics Report, Vol. 23, No. 11, Supplement (2), February 1975.

b. National Center for Health Statistics, "Final Mortality Statistics, 1974," Monthly Vital Statistics Report, Vol. 24, No. 11, Supplement, February 1976.

c. National Center for Health Statistics, "Final Mortality Statistics, 1975," Monthly Vital Statistics Report, Vol. 25, No. 11, Supplement, February 1977.

d. National Center for Health Statistics, "Final Mortality Statistics, 1976," Monthly Vital Statistics Report, Vol. 26, No. 12, Supplement (2), March 30, 1978.

e. U.S. Bureau of the Census, "Projections of the Population of the United States: 1977 to 2050," Current Population Reports, Series P-25, No. 704, July 1977, and unpublished data.

females than for males (table 10). The comparison suggests that the possibilities for improvement for males in the United States are greater than for females and that some convergence of the values for males and females may be realized. This analysis also suggests that the male-female difference may have a substantial, irreducible minimum in post-industrial society.

As noted earlier, the present large difference presumably reflects both a biological advantage of women and the persistent, sizeable differentiation of the life styles, roles, and personal habits of the sexes. Even if men are afforded improved environmental "opportunities" or the environmental circumstances for females become more prejudicial to their health, a substantial difference in favor of women is expected to remain for several decades.

The projections of mortality incorporated in the Census Bureau's latest projections of population are adaptations of mortality projections prepared by the Social Security Administration that took explicit account of past trends in death rates for age, sex, and cause categories. They imply moderate reductions in death rates[21] and a modest increase in expectation of life at birth and at age 65 between 1976 and 2020. For the year 2020, the projected figure for average life expectancy for both sexes is 75.0 years, as compared with the base estimate of 73.1 years in 1976 (table 10). For males separately, the life expectancy value set for 2020 is 70.7 years, as compared with 69.1 years for 1976. The corresponding figures for females are 79.4 and 77.0. These figures imply a modest continuation of the divergence between male and female death rates and life expectancies that has been observed so far in this century.

**Evaluation of earlier official projections of mortality and the older population.** In view of the widespread use of the Census Bureau's projections of the older population, it is useful to review the "accuracy" of past projections of the older population and the underlying projections of mortality. For this purpose the projections of the number of elderly persons for 1975 and 2000, included in the sets of projections published in the last 25 years or so by the Census Bureau, have been compared with the current estimate for 1975 and with the latest projections for the year 2000 (table 11).

The projections of the population 65 years and over for 1975 published at various dates from August 1953 to December 1972 varied from 20.7 million (August 1953 and October 1955) to 22.2 million (December 1972). These figures differed from the current estimate for 1975 (22.4 million) by 7.9 percent and 1.1 percent, respectively. In all cases the projections fell below the current estimate.

[21] Death rates were assumed to decline at different rates at different ages between 1976 and 2050. It is estimated that the average percent decline in age-specific death rates for this period was 17 percent. This figure was obtained as the difference between the age-adjusted death rates calculated on the complements of 5-year survival rates in 1976 and 2050.

## Table 11. Comparison of Estimates and Projections of Populations 65 Years and Over and 70 Years and Over: 1975 to 2000

(Numbers in thousands. Estimates and projections as of July 1)

| Age group and projection | 1975 | | | 2000 | | |
|---|---|---|---|---|---|---|
| | Population | Difference from current estimate | | Population | Difference from latest projection[1] | |
| | | Amount | Percent | | Amount | Percent |
| 65 YEARS AND OVER | | | | | | |
| Current estimate[2] | 22,420 | (X) | (X) | (X) | (X) | (X) |
| Projections (P-25 report number and date of issue):[3] | | | | | | |
| 704 (July, 1977) | (X) | (X) | (X) | 31,822 | (X) | (X) |
| 601 (Oct., 1975) | 22,330 | -90 | -0.4 | 30,600 | -1,222 | -3.8 |
| 493 (Dec., 1972) | 22,170 | -250 | -1.1 | 28,842 | -2,980 | -9.4 |
| 470 (Nov., 1971) | 21,859 | -561 | -2.5 | 28,839 | -2,983 | -9.4 |
| 448 (Aug., 1970) | 21,503 | -917 | -4.1 | 28,837 | -2,985 | -9.4 |
| 381 (Dec., 1967) | 21,160 | -1,260 | -5.6 | 28,184 | -3,638 | -11.4 |
| 286 (July, 1964) | 21,172 | -1,248 | -5.6 | 28,199 | -3,623 | -11.4 |
| 187 (Nov., 1958) | 21,872 | -548 | -2.4 | (NA) | (NA) | (NA) |
| 123 (Oct., 1955) | 20,665 | -1,765 | -7.9 | (NA) | (NA) | (NA) |
| 78 (Aug., 1953) | 20,689 | -1,731 | -7.7 | (NA) | (NA) | (NA) |
| 70 AND OVER | | | | | | |
| Current estimate[2] | 14,319 | (X) | (X) | (X) | (X) | (X) |
| Projections (P-25 report number and date of issue):[3] | | | | | | |
| 704 (July, 1977) | (X) | (X) | (X) | 22,630 | (X) | (X) |
| 601 (Oct., 1975) | 14,233 | -86 | -0.6 | 21,577 | -1,053 | -4.7 |
| 493 (Dec., 1972) | 14,484 | 165 | 1.2 | 20,310 | -2,320 | -10.3 |
| 470 (Nov., 1971) | 14,169 | -150 | -1.0 | 20,226 | -2,404 | -10.6 |
| 448 (Aug., 1970) | 13,983 | -336 | -2.3 | 20,306 | -2,324 | -10.3 |
| 381 (Dec., 1967) | 13,690 | -629 | -4.4 | 19,859 | -2,771 | -12.2 |
| 286 (July, 1964) | 13,688 | -631 | -4.4 | 19,866 | -2,764 | -12.2 |
| 187 (Nov., 1958) | 14,089 | -230 | -1.6 | (NA) | (NA) | (NA) |
| 123 (Oct., 1955) | 13,117 | -1,202 | -8.4 | (NA) | (NA) | (NA) |
| 78 (Aug., 1953) | 13,131 | -1,188 | -8.3 | (NA) | (NA) | (NA) |

X Not applicable.
NA Not available.
[1] Current Population Reports, Series P-25, No. 721, April 1978.
[2] Latest projection is 31,822,000, published in Current Population Reports, Series P-25, No. 704, July 1977.
[3] Base date may be a few months to one and a half years prior to publication date and final death statistics used may relate to a calendar year two to three years before the publication date.

One of the earliest projections in this series (November 1958) showed a relatively low deviation from the current estimate, 2.4 percent. Except for this figure, the percent deviation generally declined as the publication date approached 1975. The corresponding percent "errors" for the projections of the population 70 and over were generally similar or somewhat smaller. The differences between the past projections and the current estimate for 1975 represent a combination of the difference in the allowance for immigration and in the census counts for the adult population (the census counts being in error also) as well as in allowances for mortality.

There is presumably great interest now in the accuracy of the projections for the year 2000. We do not, of course, have current figures for evaluating the projections for this year, but we can examine the deviation of the projections published in July 1964 to October 1975 from the latest projection for 2000, 31.8 million, published in July 1977. All projections fell below the latest figure and generally the projections had to be revised upward when a new set of projections was prepared. The differences between the various projections and the 31.8 million varied from 4 percent to 11 percent. The projections approximated 28-29 million until 1975 and 30½ million in 1975, when the Census Bureau introduced a new set of mortality projections. The various projections for ages 70 and over in 2000 show a similar pattern of differences from the latest projection.

The latest projection of the population 65 and over for the year 2000 (31.8 million) is 4 percent greater than the last previous projection (30.6 million), and the latest projection of the population 65 and over for the year 2020 (45.1 million) is 5 percent greater (42.8 million). These differences reflect mainly the lower-than-anticipated mortality of the 1972-76 period and the use of more favorable mortality rates for future years.

Mortality trends are difficult to predict although they present a much smaller problem for projections of population than do projections of fertility trends. Employing a single assumption of regular small declines in mortality rates at the older ages is no longer a safe course to follow. Death rates may decline at different rates in successive periods

or even rise, as they have in the last several decades and as fertility has done, although the reasonable bounds are much narrower for mortality than fertility in the short term. These new uncertainties suggest the desirability of making alternative assumptions regarding future mortality, as has been done for fertility.

Although it would be desirable to hit the future population on target, this is not to be expected. Happily, the kinds of errors in the projections of mortality that the Census Bureau has made are far smaller in their impact on population size and structure, and hence less problematic, than the kind of errors normally associated with projections of fertility, the young population, and even the total population. In spite of the errors in the mortality projections, the Census Bureau projections of the elderly population have tended to reflect the future size of this group, its fluctuations, and its rate of increase reasonably well. Policy formulation and administrative action based on the population numbers as projected would not be seriously prejudiced by their "errors".

The percentage of the population 65 and over projected today for the year 2000 is substantially higher than was projected for this group in past years. The principal reason for the earlier understatement of the percentage has been the failure to project fertility satisfactorily for the intervening period. If the lower fertility assumptions employed now for the year 2000 were combined with the earlier projections of the number of elderly persons, the resulting percentages of elderly persons for the year 2000 would be much closer to the latest projections of the percentage.

**Alternative analytical and theoretical models of mortality.** It is of value in understanding the possible influence of future changes in mortality on population size and structure to posit various alternative mortality assumptions, including some which are relatively unrealistic or even highly theoretical. The purpose of such an exercise is not primarily to make alternative predictions; it is to aid in elucidating the role of mortality declines as a factor affecting population size and structure. Such mortality series may also serve to measure the adequacy and "robustness" of the principal series of mortality projections. Four analytical or theoretical series of projections were developed for these purposes. They are:

1. Death rates of 1976 remain unchanged.
2. Death rates decline twice as rapidly between 1976 and 2050 as in Census Bureau projections.
3. Death rates of 1976 are reduced by one-half in 2050.
4. Death rates of 2050 are zero ("gradual immortality").

In all series, the death rates were derived for intermediate years by geometric interpolation. These death rates were combined with the three fertility assumptions and the single immigration assumption of the Census Bureau projections to derive new population projections. The effect of still different fertility, mortality, and net immigration assumptions (e.g., 300,000 net immigration per year) may be derived by interpolation of the appropriate population series or of the appropriate summary measures.

The first series provides an analytic (zero) base for measuring the number of lives saved by the improvement in death rates assumed in the various other series. Series (2) and (3), representing much more extreme assumptions than the Census Bureau series, are viewed as somewhat unrealistic. They are designed to evaluate the sensitivity of the population parameters to alternative mortality assumptions. The fourth series, gradual immortality, aids in focusing on a possible trajectory of mortality and population change resulting from radical declines in mortality in the next several decades.

The effect of these alternative fertility and mortality assumptions on a range of measures bearing on the size and structure of the future elderly population in 2000 and 2020 has been examined. These measures are: The number of persons 65 and over and 75 and over and their percent increases, the proportion of persons 65 and over, the proportion of 75-year-olds among 65-year-olds, the numerical gap between the sexes, the relative number of elderly males and females, and so-called societal and familial aged dependency ratios. For several of these measures the choice of fertility assumption has no effect in the next half century, such as the number 65 and over, the number 75 and over, the male-female difference, the sex ratio of the population 65 and over, and the ratio of persons 65-79 to persons 45-49 (familial dependency ratio). For the proportion 65 and over and the ratio of persons 65 and over to persons 18-64 (societal dependency ratio), both the fertility assumption and the mortality assumption affect the measure. We focus particularly on the comparative variation resulting from the three different fertility series, on the one hand, and the Census Bureau series on mortality, the series doubling the Census Bureau rate of decline in death rates, and the series reducing the initial death rates by one-half in 2050, on the other.

The projected decline in death rates in the Census Bureau series added some 900,000 persons (3 percent) to the population 65 and over in the year 2000 and some 2.8 million (7 percent) in the year 2020 (table 12). As a result of the net immigration assumed, some 370,000 persons (1.2 percent) were added to the number in 2000 and 1.7 million persons (4 percent) were added in 2020. If the assumed decline in death rates were twice as rapid, the elderly population would be substantially larger at both dates; the additions to the Census Bureau projections would be 1.5 million in 2000 and 4.4 million in 2020. Reducing the current rates by half would add even more elderly persons.

The percent 65 and over would also be raised under the alternative mortality series, but the increases tend to be small. If death rates were assumed to decline twice as rapidly as originally, the percent would be 12.6 instead of 12.2 in 2000, and 16.5 instead of 15.5 in 2020, under the middle fertility series. The fertility assumption has a much greater effect on the percent 65 and over than the mortality assumption; the original projections for 2000 vary from 11.3 to 12.9. In fact, the effect of the immigration assumption is as great as the effect of the mortality assumption, albeit in the opposite direction.

Note, however, that lower mortality per se does not account for the higher percent of elderly; rather it is the secondary assumption that larger mortality declines, and

## Table 12. Parameters for the Elderly Population Under Alternative Fertility and Mortality Assumptions: 1976, 2000, and 2020

(Numbers in thousands)

| Population parameter | 1976 | 2000[2] | | | | | 2020[2] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Census[1] Bureau | Mortality assumption | | | | Census[1] Bureau | Mortality assumption | | | |
| | | | Set 1 | Set 2 | Set 3 | Set 4 | | Set 1 | Set 2 | Set 3 | Set 4 |
| 1) Population, 65 years and over | 22,934 | 31,822 | 30,923 | 33,278 | 33,855 | 63,799 | 45,102 | 42,327 | 49,483 | 51,301 | 129,691 |
| 2) Percent increase over 1976 | (X) | 38.8 | 34.8 | 45.1 | 47.6 | 186.9 | 96.7 | 84.6 | 115.8 | 123.7 | 465.5 |
| 3) Population, 75 years and over | 8,741 | 14,386 | 13,791 | 15,224 | 15,916 | 42,583 | 16,975 | 15,316 | 19,458 | 21,495 | 90,607 |
| 4) Percent increase over 1976 | (X) | 64.6 | 57.8 | 74.2 | 82.1 | 387.2 | 94.2 | 75.2 | 112.6 | 145.9 | 936.6 |
| PERCENT 65 AND OVER | | | | | | | | | | | |
| 5) Series I (High) | 10.7 | 11.3 | 11.0 | 11.6 | 11.9 | 20.1 | 12.7 | 12.1 | 13.6 | 14.1 | 28.3 |
| 6) Series II (Medium) | | 12.2 | 11.9 | 12.6 | 12.9 | 21.6 | 15.5 | 14.8 | 16.5 | 17.2 | 33.0 |
| 7) Series III (Low) | | 12.9 | 12.7 | 13.3 | 13.6 | 22.8 | 17.8 | 17.0 | 18.9 | 19.6 | 36.6 |
| 8) Percent, 75 years and over / 65 years and over | 38.1 | 45.2 | 44.6 | 45.7 | 47.0 | 64.7 | 37.6 | 36.2 | 39.3 | 41.9 | 69.9 |
| 9) Excess of females over males, 65 years and over | 4,207 | 6,388 | 6,151 | 6,915 | 6,181 | 5,221 | 8,166 | 7,544 | 9,217 | 7,462 | 3,865 |
| 10) Sex ratio, 65 years and over | 69.0 | 66.6 | 66.8 | 65.6 | 69.1 | 85.3 | 69.3 | 69.7 | 68.6 | 74.6 | 94.2 |
| 11) Ratio (per 100) 65 to 79 years / 45 to 49 years | 156.4 | 125.5 | 123.3 | 128.9 | 129.5 | 172.0 | 215.9 | 207.6 | 229.1 | 229.4 | 303.1 |
| RATIO (PER 100) 65 YEARS AND OVER / 18 TO 64 YEARS | | | | | | | | | | | |
| 12) Series I (High) | 18.1 | 19.5 | 19.0 | 20.3 | 20.7 | 38.7 | 22.7 | 21.5 | 24.5 | 25.6 | 60.8 |
| 13) Series II (Medium) | | 19.9 | 19.4 | 20.7 | 21.1 | 39.5 | 26.0 | 24.6 | 28.0 | 29.2 | 69.1 |
| 14) Series III (Low) | | 20.2 | 19.7 | 21.0 | 21.5 | 40.1 | 28.6 | 27.1 | 30.8 | 32.2 | 75.7 |

X Not applicable.
[1]Current Population Reports, Series P-25, No. 704, July 1977.
[2]Set 1 Death rates of 1976 remain unchanged.
Set 2 Death rates decline twice as rapidly between 1976 and 2050 as in latest Census Bureau projections.
Set 3 Death rates of 1976 are reduced by one-half in 2050.
Set 4 Death rates of 2050 are zero.

hence larger increases in survival rates, will occur at the older ages, than at the younger ages. This assumed pattern of declines in mortality would result in larger percent increases in the population at the older ages than at the younger ages and, hence, a rise in the proportion of the population at the older ages.

Uniform *percentage* reductions in death rates, such as are implied in sets (3) and (4), consistently result in higher proportions of the elderly. They necessarily produce larger *absolute* decreases in death rates, and larger *percentage* increases in survival rates, at the older ages than at the younger ages. The rise in the proportion of the elderly would be reinforced by declining fertility. Under the assumption that death rates are cut in half by 2050, the percent over 65 would rise to 12 to 13½ (depending on the fertility assumption) in 2000 (as compared with the Census Bureau projection of 11½ to 13), and to 14 to 19½ in 2020 (as compared with the Census Bureau projection of 12½ to 18). Under an assumption of "gradual immortality" some 20 to 23 percent of the population would be over 65 in the year 2000; for 2020 the percents are higher and the range is wider, 28 to 37. It seems clear that the proportion of elderly persons in future years will not be greatly affected by the choice of mortality assumption, unless that assumption is a radical one, but that the choice of fertility assumption can have a significant effect.

The alternative assumptions on mortality have little effect on the proportion of 75-year-olds of all 65-year-olds in 2000, and only an extreme reduction in death rates (e.g., 50-percent reduction) would substantially change the proportion in 2020. The immigration assumption has practically no effect on this ratio.

The ratio of elderly persons to "working-age" persons would tend to be slightly higher with lower mortality rates. Mortality would share with fertility much of the influence in affecting the ratio in 2000, but would have relatively little effect in 2020. This shifting role of mortality is a result of the fact that the numerator of the ratio at both these dates is influenced only by the mortality level while the denominator is influenced by fertility in an increasing degree as time passes.

The excess of elderly females over elderly males is not seriously affected by the mortality assumption to 2000, but in the long run the pattern of declines in mortality by age and sex and the extent of the decline have a large effect on the size of the difference. Similarly the sex ratio of the elderly may fall or rise in the long run, depending on the age-sex pattern of the declines in death rates and the rate of decline.

In sum, reasonable alternative possibilities for declines in death rates (i.e., barring the most extreme assumptions), with allowance for alternative levels of fertility, do not substantially change the picture with regard to the parameters of

the elderly population for the next 25 years, but may do so over a longer period, such as 40 to 50 years.[22]

## SOME SOCIOECONOMIC IMPLICATIONS

The demographic changes mentioned have many important social and economic implications. I focus here on some of these, particularly those relating to the current and future requirements for health services.

### Societal and Familial Aged Dependency Ratios

**Societal dependency.** The relative number of elderly persons (65 and over) and persons of the usual working ages (18 to 64), which roughly reflects the balance of elderly "dependents" to "producers", more than doubled between 1920 and 1960. The figure has been barely rising since then and is expected to continue increasing slowly in the next several decades (table 13). The ratio was 18 per 100 persons 18 to 64 in 1976; it may rise only slightly to 20 by 1990, where it may remain for a few decades, and then it would rise sharply (26 in 2020, Series II) as the postwar birth cohorts reach 65 years of age. This is the period when support of the elderly by public funds, whether secured as Social Security taxes or general revenue (both being disbursed as intergenerational transfers), may become a serious problem of public finance.

**Familial dependency.** The trend in the relative numbers of persons 65 to 79 and persons 45 to 49 can be used to illustrate roughly the prospective shifts in the ratio of elderly parents to the children who would "support" them. This measure increased sharply and steadily between 1920 and 1976, when there were 156 persons 65 to 79 per 100 persons 45 to 49. A peak will be reached in 1980 at 180, and again in the year 2020 with a still higher figure of 216. Thus, the ratio of the number of elderly persons to the number of younger persons of the next generation will become more favorable at times and less favorable at others, with the most rapid shift to an unfavorable balance occurring in the second decade of the next century.

The fluctuations in these familial dependency ratios reflect mainly past trends in the number of births, which have tended to move in a wavelike fashion in the last several decades. For example, the very high ratio in the year 2020 results from the combination of the relatively large (average annual) number of births in the postwar decade (population 65-74 years) and the small (average annual) number of births in the early seventies (population 45-49 years).

With declining or low fertility, elderly persons will have fewer brothers and sisters and fewer children than in the past to provide needed or desirable economic and psychological support. This will occur in spite of increasing survivorship of children and siblings. Past and prospective shifts in fertility, mortality, and age structure are obviously not the only factors affecting the problem of the support of the elderly, but the shifts in societal and familial dependency ratios suggest that the extent of the problem of familial and societal support of the aged will become greater at times than at present, and possibly serious after 2010.

There is the definite possibility of a condition of population stationarity (i.e., zero population growth) in the United States in the next 75 years resulting from recent and prospective low fertility. Such a stationary population will be characterized by a smaller proportion of elderly persons who have living relatives of the same or next generation, a higher proportion of elderly persons in the population, and a higher ratio of aged persons to persons of the usual working ages. This situation suggests that Government may be expected to play a bigger part in the support of the elderly, particularly in providing health and other services.[23]

### Provision of Health Care

The demographic changes identified will mean that the needs of the elderly will account for larger and larger share of the health effort, resources, and budget. The aged are the largest users of health resources. They make more visits to physicians (per person) and use hospital facilities more frequently than any younger age group.[24] Given the great increase in the number of elderly persons expected in the next half century and assuming even the same per capita demand for health care for each age-sex group in the future as at present, the total demand for health care will tend to increase greatly. The expected rise in the proportion of elderly persons, reflecting the relatively more rapid increase in the number of elderly persons than of younger-age persons, will augment greatly the relative demand for health care on the part of the elderly population in future years. The upward shift in the average age of the elderly, combined with the sharply increased demand for health care within the older age span, will add further to the increase in overall demand and to the elderly population's share.

We can anticipate increasing utilization of health care resources per capita among the elderly in part because of the expected increase in the educational and income level of the elderly and their increased participation in broad health insurance plans. A more educated and affluent population of prospective older patients will tend to seek more comprehensive health care services and advanced methods of

[23] Preston has also examined the possible changes in the U.S. population parameters with some extreme assumptions of declines in mortality in: Samuel H. Preston, **Mortality Patterns in National Populations**, New York, Academic Press, 1976, esp. Chapter 7. He shows that, if deaths due to cardiovascular diseases were immediately eliminated, the number and proportion of elderly people would increase sharply in the first few decades and then would continue to increase more slowly. Under conditions of replacement-level fertility, the proportion would reach about 25 percent in three-quarters of a century. The increase in the proportion of the elderly resulting from the elimination of cancer would be far less than the corresponding increase from the elimination of cardiovascular diseases. Elimination of any important cause, particularly cardiovascular diseases or cancer, would also tend to raise the sex ratio of the elderly. For example, the present sex ratio of 69 males to 100 females would rise by several points in a single decade if cardiovascular diseases were immediately eliminated.

[24] Ethel Shanas and Philip M. Hauser, "Zero Population Growth and the Family Life of Old People," **Journal of Social Issues**, Vol. 30, Number 4, 1974, pp. 79-91.

[25] U.S. Public Health Service, **Health, United States, 1976-77**, 1978, esp. chapter 1.

**Table 13. Familial Aged Dependency Ratios and Societal Aged Dependency Ratios: 1920 to 2020**

(Figures are shown for July 1 of the year indicated. Ratios for 1940 and later years include Armed Forces overseas)

| Year | Population 65 to 79 years / Population 45 to 49 years | Population 65 years and over / Population 18 to 64 years |
|---|---|---|
| ESTIMATES | | |
| 1920 | 0.76 | .08 |
| 1930 | 0.82 | .09 |
| 1940 | 0.95 | .11 |
| 1950 | 1.16 | .13 |
| 1960 | 1.29 | .17 |
| 1970 | 1.35 | .17 |
| 1976 | 1.56 | .18 |
| PROJECTIONS | | |
| 1980 | 1.80 | .18 |
| 1990 | 1.68 | .20 |
| 2000 II | 1.25 | .20 |
| 2000 Range I | | .20 |
| 2000 Range III | | .20 |
| 2010 II | 1.27 | .20 |
| 2010 Range I | | .19 |
| 2010 Range III | | .21 |
| 2020 II | 2.16 | .26 |
| 2020 Range I | | .23 |
| 2020 Range III | | .29 |

Source: U.S. Bureau of the Census, Census of Population, 1930, General Report, Vol. II, table 7, and Current Population Reports, Series P-25, Nos. 311, 519, 614, 643, and 704; unpublished data for age group 45-49 for years 2010 and 2020.

treatment, resorting more often to specialists and use of specialized equipment.

The demand for mental health services may also be expected to rise sharply as a result of the effect of these same demographic factors. The incidence of emotional disorders rises with increasing age. Emotional disorders constitute an important factor accounting for a change in living arrangements (i.e., moving in with children, institutional care). They represent, therefore, an important share of the real total health care requirements of the elderly and the general population.

Given the relation of social isolation to emotional disorders and the prominence of emotional disorders among elderly persons, it may be possible to trace a logical nexus between the small family system (low fertility, "nucleation" of families, and "individuation" of households), a large male-female mortality gap, and high internal migration rates of younger relatives, on the one hand, and the prevalance of emotional disorders among the elderly, on the other. Of course, any such relation is reinforced by low income, loss of the work role, poor physical health, and limited ambulatoriness on the part of many elderly persons.

## Issues Relating to Sex Differences in Mortality

The large sex difference in mortality has a considerable impact on many aspects of our social life. In addition to the fact that it results in a large excess of women at the older ages, it tends to produce a high rate of widowhood and paternal orphanhood, major economic losses to families and society, and loss of familial psychological and social support for the surviving women. Its ultimate price in life dissatisfactions are immense and incalculable.

In view of the considerable differences between the mortality levels of males and females and the tremendous demographic, social, and economic consequences that flow from these differences, it is essential that we try to understand better the relative etiological roles of genetic and environmental factors in producing the differences. More needs to be learned about those aspects of the behavior and genetic makeup of males that make them more vulnerable than females to serious illness. Are there, for example, male-female differences in recognizing the need for, seeking, and accepting medical care? The conduct of KAP (knowledge-attitude-practice) studies for mortality, as has been done

for fertility, may help to provide an answer to this question. Can the physiological bases for the female advantage be more clearly identified?

Whether or not we can fully understand the underlying bases of the difference in the mortality of the sexes, its great magnitude, its persistence, and its many and profound consequences justify a major assault on the problem. Imaginative and wide-ranging programs should be launched with the prevention of premature death of males as a specific goal. The goal of greater sex equality in length of life may be viewed as sufficiently important to call for a course of preferential treatment for men.

## Other Issues Relating to Mortality

The same issues as just presented for male-female mortality differences may be considered in relation to Black-White differences *mutatis mutandis*, although here the differences are not as marked and have been declining over time, the disadvantage is not consistently in one direction over the age span, and the social consequences are not as profound. The issues here relate primarily to the substantial excess of the mortality of Blacks over Whites at the ages below about age 75.

Various bioethical and other nonmedical considerations are involved in decisions regarding the allocation of funds for health research and provision of health care to elderly people. In particular, there is a problem of making decisions about the allocation of limited resources where different applications will have different payoffs in lives ultimately saved. Available funds are always assigned on a discretionary basis to different public programs and, within the domain of health, to different programs for health prevention, maintenance, and treatment.[25]

One issue is whether it is more effective to allocate additional research funds for heart disease or cancer. One can begin to develop an answer to this question from available information. One should decide whether it is more desirable to maintain the life of very sick, extremely aged persons at all costs or to apply some of these funds for preventive purposes to younger adults. The latter course could, in the long run, be more effective in improving the average quality of life among the elderly and equalizing death rates of the sexes. For example, it might be more cost-effective (in terms of years of life added) to spend a larger share of community funds on mobile cardiac units, use of which might prevent the death of many middle-aged husbands and fathers, and less on drastic mechanical methods of life prolongation for extreme-aged persons who are already very seriously ill.

As increasing numbers of persons survive to the older ages and particularly as the proportion of older persons in the population increases, the relative frequency of persons with chronic, seriously debilitating conditions of later life, including incurable and intractable conditions, will increase. This development suggests the need for more widespread confrontation of the complex bioethical issues relating to "life with dignity" and the "right to die" and for exploration of these concepts in relation to the general issue of basic human rights.

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[25] Victor R. Fuchs, **Who Shall Live? Health, Economics, and Social Change**, Basic Books, New York, 1974; Steven E. Rhoades, "How Much Should We Spend to Save a Life?" **The Public Interest**, No. 51, Spring 1978, pp. 74-92.